

A taxonomic revision of *Pseudoweinmannia* Engl. (Cunoniaceae: *Geissoieae*)

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Summary

Rozefelds, A.C. & Pellow, B. (2011). A taxonomic revision of *Pseudoweinmannia* Engl. (Cunoniaceae: *Geissoieae*). *Austrobaileya* 8(3): 252–266. The vegetative and reproductive morphology of *Pseudoweinmannia* is described and illustrated. The genus is endemic to eastern Australia with two species, *Pseudoweinmannia apetala* (F.M.Bailey) Engl. and *P. lachnocarpa* (F.Muell.) Engl., that can be differentiated by their leaf serration, stipule morphology and flower and fruit characters. New interpretations of floral and fruit morphology in *Pseudoweinmannia* are discussed, and their significance in better understanding the phylogenetic relationships within the tribe *Geissoieae* are examined.

Key Words: Cunoniaceae, *Geissoieae*, *Pseudoweinmannia*, *Pseudoweinmannia apetala*, *Pseudoweinmannia lachnocarpa*, Australia flora, Queensland flora, New South Wales flora, comparative morphology

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Introduction

The family Cunoniaceae includes 15 genera in Australia, which are all primarily rainforest trees and/or shrubs, and are currently being revised for the *Flora of Australia*. Recent revisions have been completed on the genera: *Anodopetalum* A.Cunn ex Endl. (Barnes & Rozefelds 2000), *Ceratopetalum* Sm. (Rozefelds & Barnes 2002), *Davidsonia* F.Muell. (Harden & Williams 2000), the Australian species of *Geissois* Labill. (Schimanski & Rozefelds 2002), *Vesselowskya* Pamp. (Rozefelds *et al.* 2001) and a new species of *Gillbeea* F.Muell. was described from north eastern Australia (Rozefelds & Pellow 2001). In this paper a revision of the Australian endemic genus *Pseudoweinmannia* Engl. is presented.

Pseudoweinmannia was proposed by Engler (1930) for two species, *Weinmannia lachnocarpa* F.Muell. and *W. apetala* F.M.Bailey from eastern Australia, which he referred to the tribe *Cunonieae* (R.Br.) Schrank & Mart. in Cunoniaceae. *Pseudoweinmannia* differs from *Weinmannia*, the major genus

in this tribe, in lacking petals, having a polyandrous androecium and tardily-dehiscent fruits. Based upon an analysis of stipule morphology Dickison & Rutishauser (1990) concluded, that *Pseudoweinmannia* was more closely related to *Geissois* and *Lamanonia* Vell. in the Tribe *Belangerae* Lindl ex Pfeiff. (= Tribe *Geissoieae* Endl. ex Meisn.), than to the Tribe *Cunonieae*.

In a cladistic analysis using morphological characters, Hufford & Dickison (1992) showed that *Pseudoweinmannia* was sister to *Geissois* (including *Lamanonia*), as it shared with this genus, lateral stipules (Dickison & Rutishauser 1990), racemose inflorescences and a polyandrous androecium. Dickison (1984) and Hufford & Dickison (1992) also identified structures on the seeds as elaiosomes, which they interpreted as a putative autapomorphy for the genus.

Combined morphological and molecular data based upon analysis of *rbcL*, and intron and spacer regions in the combined *trnL*-G region, and chloroplast DNA data provide support for interpreting *Pseudoweinmannia* and *Geissois* *sens. lat.* as sister taxa (Bradford & Barnes 2001). These authors recircumscribed the

Tribe *Geissoieae* (= Tribe *Belangerae sensu* Dickison & Rutishauser 1990) to include the Australian and New Caledonian species of *Geissois*, *Lamanonia* from South America, and *Pseudoweinmannia*.

Pseudoweinmannia is endemic to eastern Australia where it is restricted to rainforests. *Pseudoweinmannia lachnocarpa* (F.Muell.) Engl. (Fig. 1) occurs in north eastern New South Wales and south eastern Queensland (Map 1), and was described by Mueller (1874) from material collected from the Tweed District in north eastern New South Wales. A second species, *Pseudoweinmannia apetala* (F.M.Bailey) Engl. (Fig. 2), was described by Bailey (1893), from Kamerunga, near Cairns in north eastern Queensland (Map 1). Bailey (1893), in describing *Pseudoweinmannia apetala*, noted that it “approaches near to *lachnocarpa* but differs in its more lax slender inflorescence, more membranous leaves, which are not so prominently reticulate, its longer stamens, as well as probably the flower lobes to the calyx”. Since their description there has not been a critical re-examination of the morphology of both species and as a result the status of *Pseudoweinmannia apetala* has become unclear. Recent reviews in flora and state censuses have either considered it a synonym of *Pseudoweinmannia lachnocarpa* (e.g. Henderson 1997; Hyland & Whiffin 1993; Jessup 2010), or a distinct species (e.g. Stanley & Ross 1983; Harden 1990; Bradford *et al.* 2004).

In this paper the vegetative and reproductive morphology of the two species is described using herbarium collections (both dried and in spirit) and consistent morphological differences are recognized between *Pseudoweinmannia lachnocarpa* and *P. apetala*. The vegetative and reproductive morphology of some key characters in *Pseudoweinmannia*, i.e. stipule morphology, inflorescence architecture and floral and fruit morphology, are also described and illustrated to permit comparisons with other genera in the Tribe.

Methods and materials

Herbarium collections examined include those from BRI, CANB, CNS (formerly in QRS), K, NSW and MEL. The principal collections used are cited herein and specimens examined with the scanning electron microscopy (SEM) are indicated by *. Common abbreviations used in specimen citation are N.P. (National Park), L.A. (Logging Area), S.F./S.F.R. (State Forest/State Forest Reserve).

Terminology follows Walsh & Entwistle (1999) for leaf morphology and Hickey (1979) for leaf architecture.

For SEM the material prepared included floral organs, pollen, seeds, and stipules. The specimens were either air-dried or critical point dried, and placed onto aluminium stubs with tape. They were then sputter coated with gold and examined with a Philips Electroscan Environmental Scanning Electron Microscope 2020, under high vacuum operated at 10–15 kV.

Results

Stipule morphology

The stipules in *Pseudoweinmannia* are keel-shaped, lanceolate structures. Developmental studies in *Pseudoweinmannia* and the Australian *Geissois* species by Dickison & Rutishauser (1990) showed that four stipular primordia arise laterally at each node. In *Pseudoweinmannia* the two stipular primordia, on either side of the node, coalesce to form a bifid laterally-positioned compound structure (Fig. 3B). The margins of the stipules have glandular trichomes and simple hairs in *Pseudoweinmannia apetala* while in *P. lachnocarpa* only glandular trichomes are present (Fig. 3A–C).

Inflorescence architecture

Schimanski & Rozefelds (2002) have described the inflorescence morphology in the Australian species of the related genus *Geissois*. Their terminology is applied here to describe the inflorescence morphology of *Pseudoweinmannia*.

The flowers of *Pseudoweinmannia* are arranged in indeterminate racemose units.



Fig. 1. Representative specimen of *Pseudoweinmannia apetala* (Ford AF3202 & Jensen [BRI])



Fig. 2. Representative specimen of *Pseudoweinmannia lachnocarpa* (Forster 9353 & Machin [BRI])

Following Bradford (1998), we use the term raceme to describe these elements, although occasionally the racemes are weakly branched (e.g. *Webb & Tracey 11246*). Bracts subtend each flower, but are quickly deciduous. The pedicels are shortly hirsute and have an abscission point about 1–2 mm above the point of attachment.

Variation in *Pseudoweinmannia*, as in the Australian species of *Geissois*, occurs at the following hierarchical levels: (1) in the varying development of the racemes and supporting axes and buds that form the inflorescence (Inflorescence Module *sensu* Bradford 1998); and (2) in the position that the inflorescences occupy in relation to the main stem axis. In both *Pseudoweinmannia apetala* and *P. lachnocarpa* the common condition, particularly in younger shoots, is for the raceme to occupy an axial position in the leaf axils and a terminal bud is present.

The pattern is more complicated in older branch units, where inflorescence units may develop in a number of leaf axils, and a compound inflorescence is formed; subtending leaves, may or may not, be present. The inflorescence could be described as a compound homothetic inflorescence (*sensu* Weberling 1989), and the arrangement of raceme-like units on the flowering stem is consistent with the decussate architecture of the shoot. In some specimens the terminal bud may also be replaced by a raceme (*Pseudoweinmannia lachnocarpa* (Blake 22848); *P. apetala* (Whiffin 5978, Gray 5978)). Heterothetic compound inflorescences (*sensu* Weberling 1989) therefore result if the terminal bud is replaced by a raceme-like unit and inflorescences are initiated in a number of leaf axils. In both *Pseudoweinmannia apetala* and *P. lachnocarpa*, heterothetic and homothetic compound inflorescences may occur on the same specimen, and no consistent inflorescence architectural differences have been identified between the two species. The racemes are somewhat variable in length, although those of *Pseudoweinmannia apetala* are usually longer than that in *P. lachnocarpa*.

Floral and fruit morphology

The flowers in both *Pseudoweinmannia* species are (5–)6(–7)-merous and polystemonous (Bradford & Barnes 2001; Bradford *et al.* 2004; Schimanski & Rozefelds 2002) (Fig. 4B,E). The sepals are valvate, ovate in shape and have a strigose indumentum over their inner and outer surfaces (Fig. 4A,D). Petals are lacking in both species (Fig. 4B,E). Anthers are introrse, dorsifixed at just below the midpoint of the anther and are weakly versatile and lack a sterile distal protrusion (Fig. 4A,D,E). A prominent, lobed annular nectary occurs at the base of the ovary (Fig. 4B,F). The ovary is bicarpellate, rarely tricarpellate, syncarpous, and is covered by a dense indumentum of strigose hairs (Fig. 4A,B,C,F). The styles are furrowed ventrally, are slightly coiled in bud and in young flowers (Fig. 4A) and straighten with flower development (Fig. 4B). The styles are exserted before the anthers and while studies on stigmatic receptivity have not been undertaken, the flowers are possibly protogynous (Fig. 4D). The stigma is papillate at maturity (Fig. 4C). The fruit is a tardily dehiscent capsule. The ovary in *Pseudoweinmannia* is divided into two parts, rarely three, indicating origin from two carpels; the two carpels are adnate and free (Fig. 5A,B). The seeds are irregularly rounded pyramidal in shape (Fig. 6A,C), with weakly reticulate cell walls (Fig. 6B,D) and lack a wing-like extension.

Comparative morphology in the Tribe *Geissoieae*

The Tribe *Geissoieae* consists of *Pseudoweinmannia*, *Lamanonia* and *Geissois* *sens. lat.*, and includes species that occur in Australia, South America and New Caledonia (Bradford & Barnes 2001). The adult leaves in *Pseudoweinmannia* are trifoliolate and have two caducous stipels at the base of the lateral leaflets. Australian *Geissois* species also have stipels, or rarely reduced leaflets, that occupy the same position as those in *Pseudoweinmannia* (Schimanski & Rozefelds 2002). The New Caledonian *Geissois* taxa and *Lamanonia* are typically digitate or trifoliolate, the most basal leaflets being the smallest. Bradford & Barnes (2001)

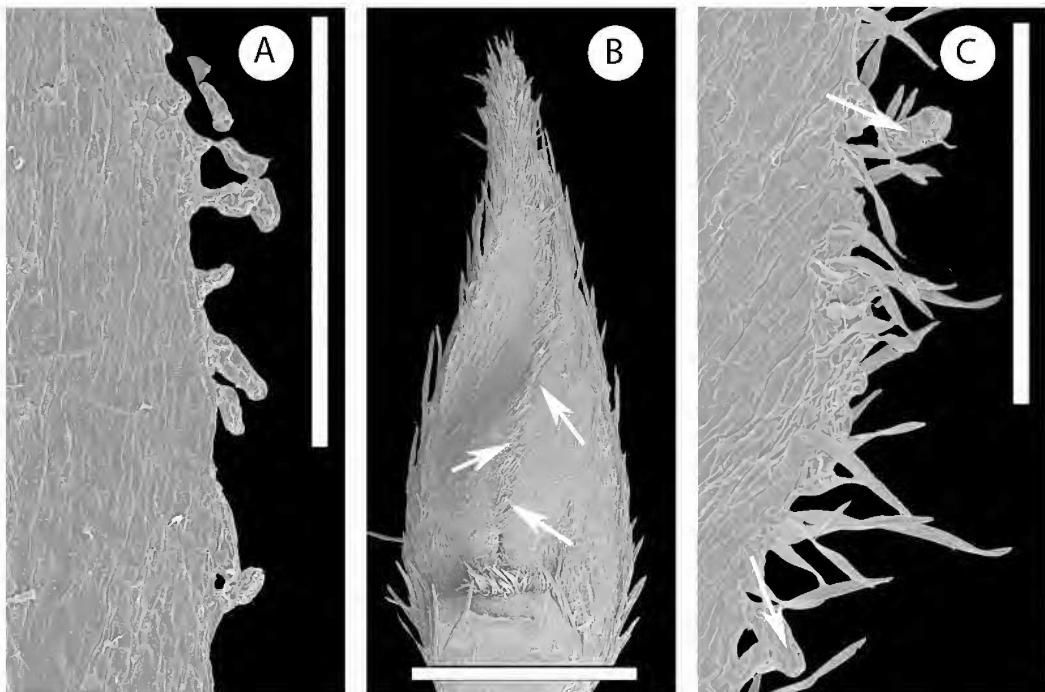


Fig. 3. Variation in stipule morphology in *Pseudoweinmannia apetala* and *P. lachnocarpa*. A. *P. lachnocarpa*, detail of stipule margin showing glandular trichomes. B. *P. apetala*, the pair of stipules and the margins between the two stipules are arrowed. C. *P. apetala* stipule, detail of stipule margin showing unicellular and glandular trichomes (arrowed). Scale bars A,C = 300 µm; B = 1 mm. A from Floyd s.n. (CANB 289092); B–C from Gray 1272 (CNS).

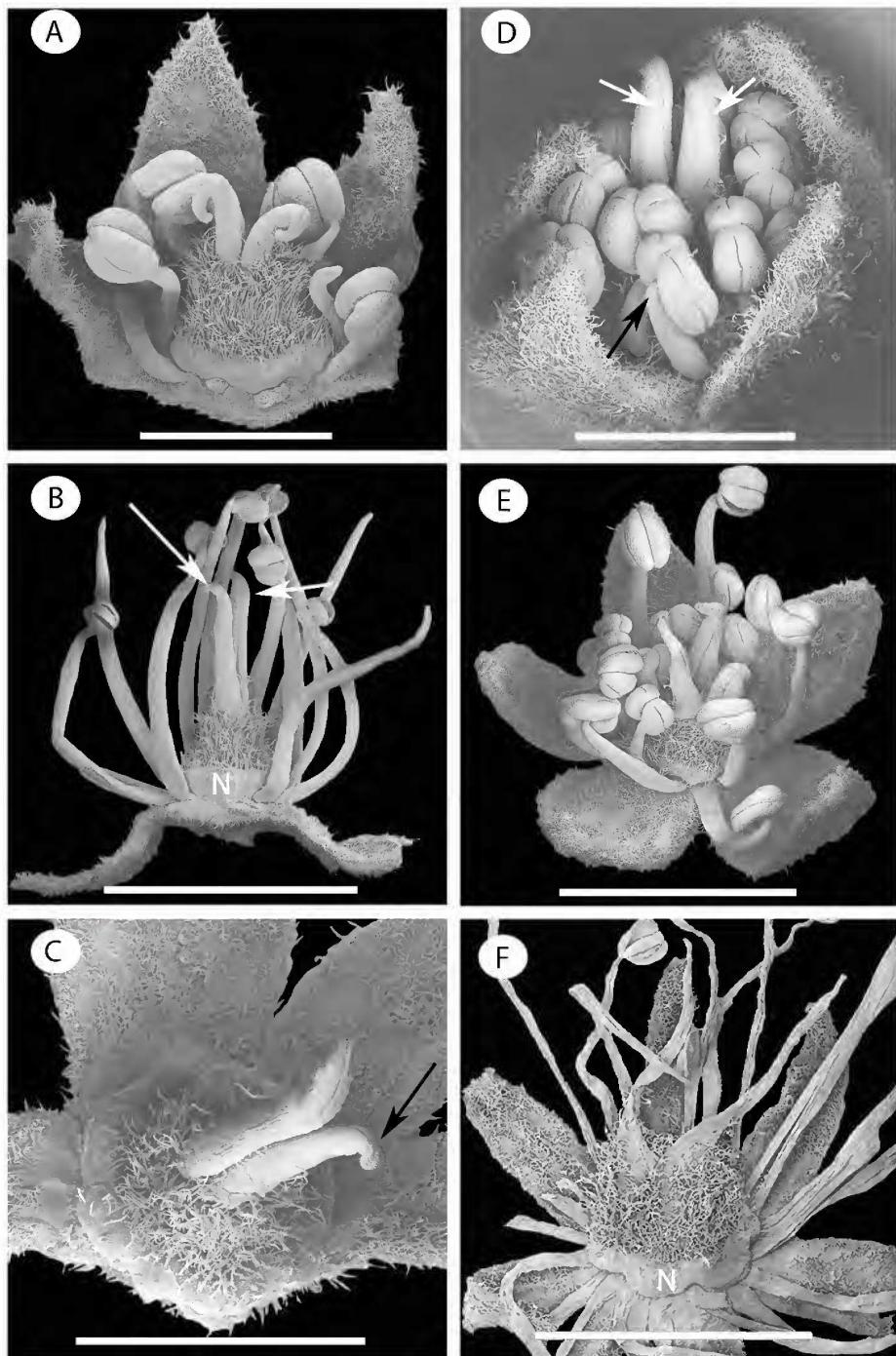
interpreted the common leaf condition in the tribe as being digitate (palmately compound), which is logical if the stipels in *Geissois* and *Pseudoweinmannia* are interpreted as homologues to lateral leaflets.

Dickison (1975) described the stomata in *Pseudoweinmannia* as anomocytic, although recent studies by Barnes in Bradford & Barnes (2001) interpreted the stomata as brachyparacytic, which is the common condition in the family and is present for all genera of the Tribe *Geissoieae*. The secondary leaf venation is semi-crasspedodromous, which is the common condition in most of the Cunoniaceae and is typical of *Geissoieae* (Hufford & Dickison 1992; Barnes pers. comm. 2011).

The androecium is defined as polyandrous in the *Geissoieae* (Bradford & Barnes 2001). In the New Caledonian species of *Geissois*, developmental studies show that the stamens are grouped together in fascicles, occupy

an episepalous position and development proceeds from a centre of the fascicle outwards in both directions (Matthews & Endress 2002). In developing flowers the inner stamens are typically larger than the outer ones in the fascicle. This arrangement of stamens is evident in older stages of flower development in the Australian species of *Pseudoweinmannia* (Rozefelds pers. obs.) and *Geissois* (Schimanski & Rozefelds 2002, figs 25, 27). The arrangement of stamens in *Pseudoweinmannia* and the Australian species of *Geissois* is considered to be weakly polyandrous.

The common fruit type in the Cunoniaceae is a bilocular, ventrally dehiscent capsule (Dickison 1984). *Geissois* s.l. and *Lamanonia* have ventrally dehiscent capsules, while those of *Pseudoweinmannia* were interpreted by Dickison (1984) as an ‘indehiscent capsule’ and Bradford *et al.* (2004) similarly referred to the fruits in *Pseudoweinmannia* as indehiscent



fruits. Other researchers have indicated that the fruits are septicidally dehiscent (Harden 1990) and open into two valves (Floyd 1989). The semantic discontinuities imposed by terms, such as 'inindehiscent' versus 'dehiscent', obscure the morphological similarities that link these genera together.

The fruits in *Pseudoweinmannia* are typically derived from two carpels, although they are obscured by the mass of fine hairs on the outside of the fruit (Dickison 1984, fig. 13). Sections through the fruit indicate that the walls of the carpels are adnate, but are not fused together (Fig. 5A,B). The placental proliferations that Dickison (1984, pl. 2, Fig. 21) illustrated were not evident in the specimens we sectioned. The thickened (sclerenchyma) walls of the capsules can be convoluted in appearance as the oblique section revealed (Fig. 5B), but near the mid-region of the fruit these walls are straight (Fig. 5B). It seems likely that Dickison's interpretations were based upon either a section through an immature fruit and/or an oblique section through the fruit that cut through the developing, convoluted walls of the capsule.

In *Pseudoweinmannia* the fruits are similar to those of the other genera as the walls of the two carpels are not fused together but stay conjoined for some time after fruit fall. The mid-section through the *Pseudoweinmannia* fruits indicates that sclerenchyma occupies a largely identical position to that seen in *Geissois stipularis* A.C.Sm (Dickison 1984, pl

2, fig. 22). All genera in the Tribe *Geissoieae* therefore have bi-locular fruits that are derived from capsules and are dehiscent or tardily dehiscent.

Pseudoweinmannia differs from the other genera in the Tribe by stipule morphology (Schimanski & Rozefelds 2002) and in seed and fruit morphology. The stipules in *Pseudoweinmannia* are keel-shaped, lanceolate structures (Fig. 3B), while those in *Geissois* from Australia (Schimanski & Rozefelds 2002) and *Lamanonia* from South America are large and often foliose (Leite 1983; Zickel & Leitao Filho 1993; Engler 1930).

Pseudoweinmannia has rounded, pyramidal seeds while the other genera in the tribe have winged seeds. Dickison (1984) described the seeds of *Geissois* s. lat. as having distal wings. *Lamanonia* also has a distal wing (Engler's (1930) illustration of *L. tomentosa* Camb. (= ?*L. ternata* Vell.); Zickel & Leitao Filho 1993; Leite 1983), and Dickison (1984) interpreted the seed in *Lamanonia ternata* as having a distal wing and lateral extensions. Dickison (1984) drew particular attention to an aril-like outgrowth on the seeds in *Pseudoweinmannia*, which he interpreted as an elaiosome. We observed a few, thin-walled parenchyma cells around the point of attachment of the seed, but we interpret these cells as being derived from the placental parenchyma (Fig. 5B,C). We are unaware of any ecological or field studies that support interpretation of these structures as an elaiosome.

The seeds of *Pseudoweinmannia* were described as having either a smooth (Dickison 1984) or papillate (Hufford & Dickison 1992) surface, although the material we examined of both species had a smooth, weakly reticulate appearance due to the cell walls (Fig. 6A–D). Dickison (1984) considered the epidermal cells of the Australian species of *Geissois* to be more ornamented and they could be identified apart by differences in the epidermal cell structures. The epidermal cells of the seed coats of *Lamanonia* and *Geissois stipularis* A.C.Sm. (New Caledonia) were described as having irregular outlines and moderately thick to thin lateral walls (Dickison 1984).

Fig. 4. (facing page) Floral morphology of *Pseudoweinmannia apetala* and *P. lachnocarpa*. A–C. *P. apetala*. A. Partially opened bud with some stamens removed to show dense covering of hairs on ovary, and curved styles. B. Mature flower with fully exserted stamens, and the two style branches are arrowed, note conspicuous disc (nectary = N) at base of ovary. C. Top view of flower and the papillate surface of the stigma is arrowed (white arrow). D–F. *P. lachnocarpa*. D. partially opened bud, note that the style branches are exserted (white arrows) and the anthers are dorsifixed at just below anther midpoint (black arrow). E. Newly open flower, note the variation in length of the stamen filaments. F. Mature flower with stamen filaments extended and basal disc (N). Scale bars A,C,D = 1 mm; B,E,F = 2 mm. A from Gray 5978 (CNS); D–E from Rozefelds s.n. (HO); F from Forster PIF9353 & Machin

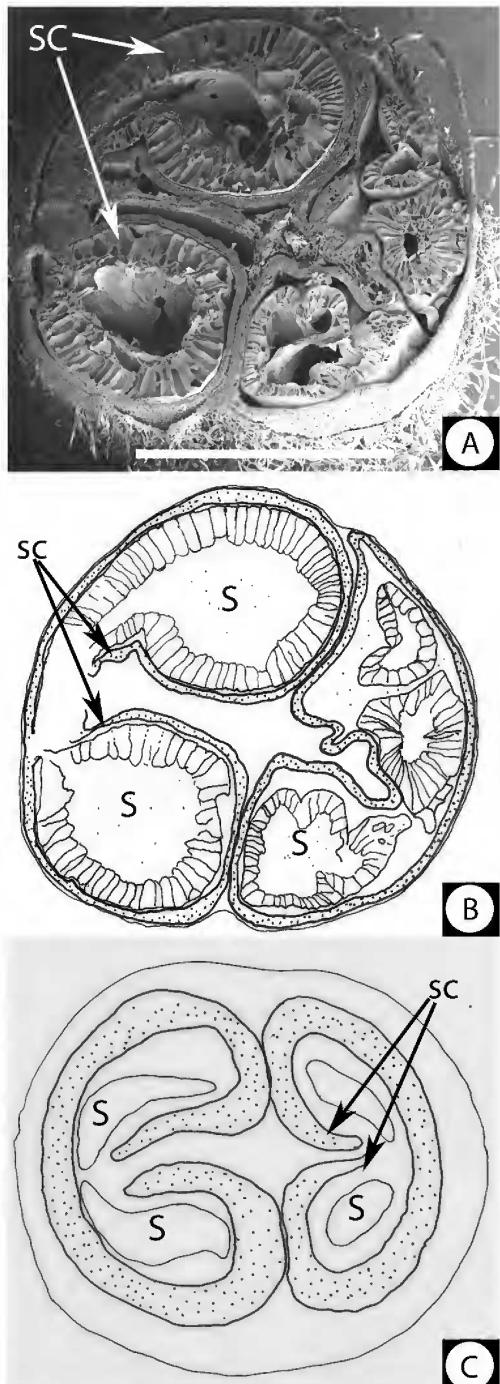


Fig. 5. A. *Pseudoweinmannia lachnocarpa*, oblique transverse section through a mature fruit. Note the position of the seeds in the fruit and the thickened seed coat (SC). B. Drawing of A showing that the walls of the two carpels are adnate but free; the sclerenchyma wall (sc) of the right hand carpel are not continuous and remain free near the mid-section of the fruit. The more oblique section through the left hand carpel shows that the convoluted sclerenchyma (sc) wall of the carpel is continuous. C. Simplified transverse section of fruit of *Geissois stipularis* A.C.Sm., redrawn from Dickison (1984), note that the sclerenchyma walls (sc) of the capsule remain free. (S = seed; SC = seed coat; sc = sclerenchyma). Scale bar = 1 mm. A from Williams s.n. (MEL).

The tribe *Geissoieae* are a very cohesive group, with all species having a similar vegetative and reproductive morphology. The species share digitate (palmately compound) leaves, brachyparacytic stomates and semi-crasspedodromous secondary venation. The floral plan in all genera consists of valvate sepals, no petals, polyandrous androecium, the anthers lack a distal connective protrusion, and the bicarpellate ovary is covered in a thick indumentum with a prominent disc (nectary) at the base. *Pseudoweinmannia* also shares with the other two genera dicolporate pollen, raceme-like inflorescences and capsular dehiscent fruits (Hufford & Dickison 1992; Bradford & Barnes 2001; Schimanski & Rozefelds 2002; herein).

Systematics

Family Cunoniaceae

Tribe *Geissoieae* Endl. ex Meisn.

Pseudoweinmannia Engl., *Nat. Pflanzenfam.* 2nd Ed., Vol. 18a: 249 (1930). **Type species:** *Pseudoweinmannia lachnocarpa* (F.Muell.) Engl. (= *Weinmannia lachnocarpa* F.Muell.)

Trees or shrubs. Leaves opposite, decussate, trifoliolate and with a pair of stipels at base of lateral leaflets (digitate); unifoliolate in coppice growth or seedlings; leaflets sessile or very shortly petiolulate, similar in size, central leaflet sometimes up to one-third larger, broadly lanceolate, elliptical to obovate, apices typically acute, less commonly obtuse, leaf bases are cuneate to attenuate, lateral leaflets base slightly asymmetrical, margin serrate, sinuses weakly to strongly

developed, *venation* semi-crasspedodromous, midrib course straight in central leaflet and slightly curved in lateral leaflets, secondary venation thickness stout, alternate, uniformly divergent, tertiary venation percurrent, complete areolation is formed by higher-order venation, teeth dark, glandular with simple apical termination. *Stipules* 4 at each node, keel-shaped, lanceolate, apex acute. *Inflorescences* usually axillary, consisting of raceme-like units, which typically occur in the upper leaf axils, or occasionally terminate the main axis. *Flowers* bisexual; *sepals* (5–)6(–7) free; *petals* absent; *androecium* weakly

polystemonous, stamens 12–25, *carpels* 2 (or 3) fused, styles subulate, 2 (or 3) distally free, ovary densely hairy, stigmas papillate, 2–4 ovules/carpel, disc (annular nectary) around base of ovary. *Fruit* a dry, tardily dehiscent capsule covered in a dense, woolly golden-brown indumentum, stamen filaments and styles persistent; carpels free; *seed* rounded-pyramidal, not winged, seed walls weakly reticulate.

Etymology: Name from the Latin *pseudo* meaning (false), and *Weinmannia* a genus named in honour of Johann Wilhelm Weinmann, German pharmacist and botanist, (1683–1741).

Key to *Pseudoweinmannia* species

Leaf margins crenulate-crenate, sinuses weakly developed; stipules fringed with glandular and simple trichomes; stamens 12–20, disc < 2.5 mm high; fruit ovoid-globose. NE Qld *P. apetala*

Leaf margins serrulate-serrate (rarely crenate), sinuses well developed; stipules fringed with glandular trichomes; stamens (12–)20–24, disc >3 mm high; fruit globose. SE Qld, NE NSW *P. lachnocarpa*

***Pseudoweinmannia apetala* (F.M.Bailey)** Engl. in Engl. & Prantl., *Nat. Pflanzenfam.* 2nd Ed., Vol. 18a: 249 (1930); *Weinmannia apetala* F.M.Bailey, *Dept. Agric. Brisbane, Bot. Bull.* 8: 76 (1893). **Type:** Queensland. COOK DISTRICT: Kamerunga, January 1892, E.Cowley 65, ‘the growing shoots from roots, flower’ (holo: BRI [AQ341025]; iso: K n.v. [photo at HO!]).

Pseudoweinmannia lachnocarpa auct. non (F.Muell.) Engl.; Hyland & Whiffin (1993: 131); Cooper & Cooper (2004: 148).

Illustrations: Christophel & Hyland (1993: pl. 25, fig. C); Cooper & Cooper (2004: 148); all as *P. lachnocarpa*.

Tree up to 30 m tall, often prominently buttressed in larger trees (Hyland & Whiffin 1993). *Outer bark* flaky (Sanderson 1634). *Branchlets* terete, bark grey with conspicuous lenticels. *Stipules* 2–5 mm long, base to 2 mm wide, margin entire with glandular trichomes (colleters) and non-glandular strigose trichomes, glabrous above, caducous. *Leaves* opposite, decussate, petiolate, trifoliolate with

two caducous stipels; *petiole* 1.5–4.5 cm long, broadly elliptic in cross-section, glabrous to sparsely strigose; *leaflets* 5–12.5 cm long, 1.5–4.9 cm wide, sessile or occasionally with short petiolule, broadly lanceolate, elliptical to obovate, apex acute to acuminate, rarely obtuse, bases cuneate to attenuate, margins typically crenulate to crenate, sinuses weakly developed; *secondary veins* 10–16 pairs, 60–80° to midrib and branching well inside margin. *Inflorescence* usually axillary, consisting of a simple raceme, 4.5–12 cm long, occasionally with one or two racemose lateral branches, or with some of the lower flowers replaced by 3-flowered dichasias; *rachis* terete, shortly hirsute with crispatate trichomes. *Flowers* bisexual; pedicels terete, 3–8 mm long, shortly hirsute with crispatate trichomes, abscission point 0.3–0.9 mm above attachment; *sepals* valvate in bud, (5–)6(–7), ovate, elliptical to narrowly ovate, 1.5–2.5 mm long, 0.6–1 mm wide, apex acute, densely hirsute distally, trichomes more sparsely distributed below; *stamens* 12–20; filaments of unequal length, 2–4 mm long, glabrous, *anthers* introrse, 0.4–0.5 mm long; *disc*

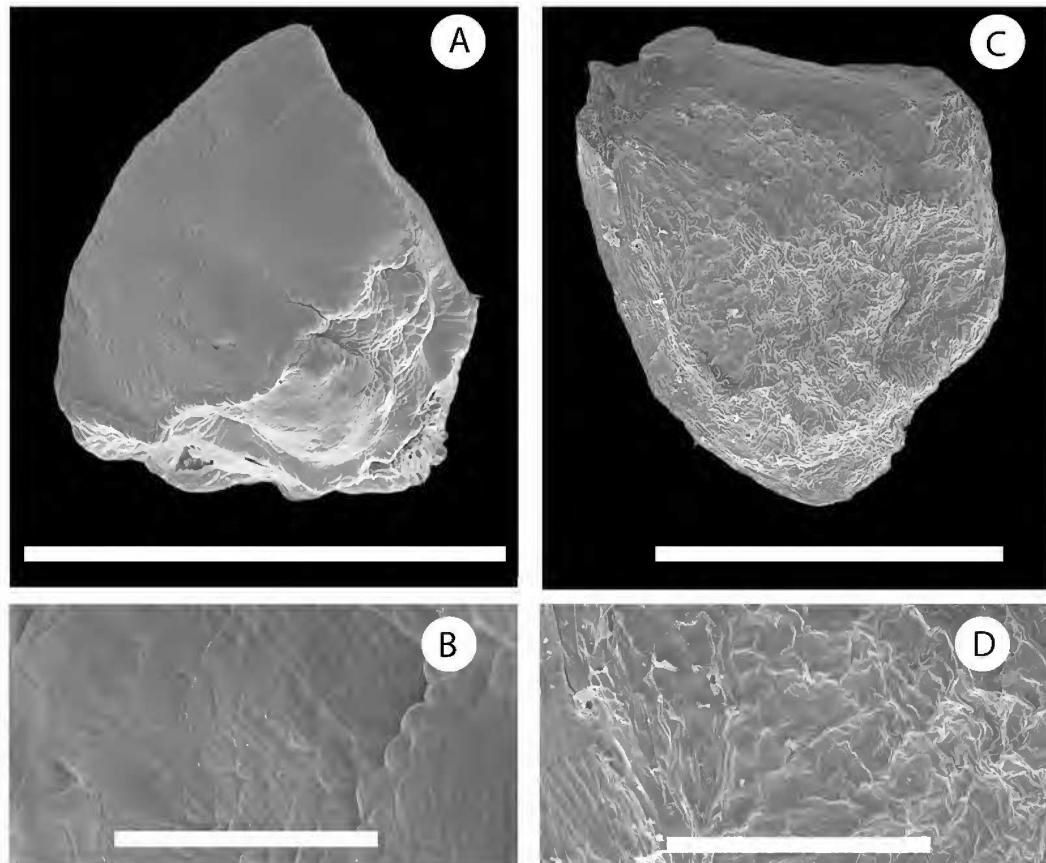


Fig. 6. Seed morphology in *Pseudoweinmannia apetala* and *P. lachnocarpa*. A & B. *P. lachnocarpa*. A. Seed showing rounded, pyramidal shape and irregular surface and angular margins. B. Detail showing reticulate appearance of the cell walls. C & D. *P. apetala*. C. seed showing rounded, pyramidal shape and angular margins. D. Detail showing somewhat more wrinkled, reticulate appearance of the cell walls. Scale bars A = 1 mm; B,D = 200 µm; C = 0.5 mm. A & B from Webb & Tracey 11246 (CANB); C & D from Risley 35 (NSW).

colour not noted, c. 0.2 mm high, glabrous, slightly lobed; *ovary* subglobular-conical, 0.6–1 mm high, 0.9–1 mm wide, externally woolly hirsute, 2 (or 3) celled, each cell with two rows of 3 or 4 ovules, tapering into 2 (or 3) free styles; *styles* subulate, 1.8–2.8 mm long, c. 0.2 mm wide at base, glabrous except for a few trichomes near the base. *Fruit* ovoid-globose, 3–4.5 mm high, 4–5 mm wide; *seed* brown. **Fig. 1.**

Additional selected specimens examined: Queensland. COOK DISTRICT: T.R. 176, Monkhouse, Oct 1982, *Hyland 12175* (CNS); Shiptons Flat on Tin Mine Road, May 1969, *Smith 14341* (BRI); E.P. 40, S.F.R. 144, Jun 1979, *Sanderson 1634* (CNS); S.F.R. 144, Dagmar, Chowchilla L.A., Feb 1995, *Gray 5978** (CNS); S.F.R. 144 Chowchilla L.A., Windsor Tableland, Dec 2001, *Ford AF3202* &

Jensen (BRI, CNS, HD); S.F.R. 1073, Dulanban, Hartley L.A., Feb 1993, *Hyland 14641** (CNS); near Kuranda, Jan 1972, *Hyland 5795** (BRI, CNS); S.F.R. 933, Little Pine L.A., Feb 1979, *Gray 1272* (BRI, CNS); S.F.R. 185, Downfall L.A., Mar 1973, *Whiffin & Risley 586* (CNS); S.F.R. 185, Downfall L.A., Jan 1985, *Gray 3848** (CNS); Downfall L.A., S.F.R. 185, Feb 1972, *Risley 35** (BRI, CANB, CNS, NSW); Atherton District, *Dansie 2053* (BRI); Bellenden Ker Range near Babinda, Jan 1979, *Jago 270** (CNS); Downfall Creek Road, near Tinaroo Dam, *s.dat.*, *Webb & Tracey 7646* (BRI); Babinda, May 1997, *Jago 634* (CNS). NORTH KENNEDY DISTRICT: Tully River, rafting access point no. 9, SE of Cardstone, Jun 2001, *Ford AF2892* (BRI, CNS).

Distribution and habitat: Restricted to north eastern Queensland from near Cardstone in the south to Rossville near Cooktown in the north (**Map 1**). *Hyland & Whiffin* (1993)

noted that *Pseudoweinmannia apetala* (under the name *P. lachnocarpa*) occurs from sea level to 800 m, commonly in drier rain forest, but also occasionally in wetter rainforest communities. Cooper & Cooper (2004) extended the altitudinal range to 950 m.

Phenology: *Pseudoweinmannia apetala* flowers from January through to April, rarely as late as June, with fruiting specimens collected from December through to March.

Notes: The notes with the type specimen i.e. "the growing shoots from roots, flower" suggest that it may have been collected from coppice growth at the base of the tree.

Etymology: The species name, *apetala*, comes from the Greek *a*, not, and Latin *petalum* for petals, which refers to the lack of petals in the flowers.

Although Cooper & Cooper (2004) list a common name as 'Marara', this application is derived from populations of *Pseudoweinmannia lachnophetala* and the adoption of this aboriginal name by people in southern Queensland and New South Wales (Bailey 1900, 1913; Maiden 1922). No common names were listed for this species by Bailey (1900, 1913).

***Pseudoweinmannia lachnocarpa* (F.Muell.) Engl. in Engl. & Prantl., *Nat. Pflanzenfam.* 2nd Ed., Vol. 18a: 249 (1930); *Weinmannia lachnocarpa* F.Muell., *Fragsm.* 8: 7 (1874); *Windmannia lachnocarpa* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 228 (1891); *Geissois lachnocarpa* (F.Muell.) Maiden, *Forest Fl. New South Wales* 7: 6 (1922). Type:** New South Wales. Tweed, s.dat., [W.] Guilloyle s.n. (lecto [here designated]: MEL104457; isolepto: K n.v., photo at HO!; Tweed, s.dat., C. Moore s.n. (lectopara: MEL104455, MEL104456).

Weinmannia lachnocarpa var. *parvifolia* F.M.Bailey, *Queensland Agric. J.* 28: 196 (1912). Type: Queensland. MORETON DISTRICT: Macpherson Range, February 1912, C.T.White s.n. (holo: BRI [AQ321400]; iso: NSW104762).

Illustrations: Maiden (1922, t. 229); Francis (1951: figs 11, 87, 88); Beadle (1976: fig. 150C); Stanley & Ross (1983: Fig. 36D1,D2); Harden (1990: 518).

Tree up to 40 m tall, often prominently buttressed in larger trees (Francis 1951; Beadle 1976). *Outer bark* grey or fawn pink usually rough with small scales and pustules (Floyd 1989). *Branchlets* terete, bark grey with conspicuous lenticels. *Stipules* 2–3.5 mm long, base to 1 mm wide, margin entire with glandular trichomes (colleters), glabrous above, caducous. *Leaves* opposite, decussate, petiolate, trifoliolate with two caducous stipels; *petiole* 1.5–3.5 cm long, broadly elliptic in cross-section, glabrescent, *leaflets* 2–13.3 cm long, 0.5–5.8 cm wide, sessile or occasionally with a short petiolule, broadly lanceolate, elliptical to obovate, apex acute to obtuse and ± acuminate, base cuneate to attenuate, margins serrulate to serrate, rarely crenate, sinuses typically strongly developed; *secondary veins* 11–16(–20) pairs, at 60–80° to midrib and branching well inside margin. *Inflorescence* typically consisting of a simple raceme, 3–10 cm long, occasionally with one or two racemose lateral branches, or with some of the lower flowers replaced by 3-flowered dichasia, *rachis* terete, shortly hirsute, with crispate trichomes. *Flowers* bisexual; *pedicels* terete, 3–8 mm long, with shortly hirsute crispate trichomes on rachis, abscission point 0.3–1 mm above attachment; *sepals* valvate in bud, (5–)6(–7), ovate-elliptical to narrowly ovate, 2–3 mm long, 0.9–1.2 mm wide, apex acute, densely hirsute distally and proximally, with sparse glands on margins; *stamens* (12–)20–24; *filaments* of unequal length 3–5 mm long, glabrous, *anthers* introrse, 0.5–0.8 mm long; *disc* red-brown in colour, c. 0.4 mm high, distinctly lobed; *ovary* globular, 0.8–1 mm high, 0.9–1 mm wide, externally woolly hirsute, 2(–3) celled, each cell with two rows of 2, 3 or 4 ovules, tapering into 2(–3) free styles, styles subulate, 2–3 mm long, c. 0.35 mm wide at base, glabrous except for a few trichomes near the base. *Fruit* globose, 3–5 mm high, 4–7 mm wide; *seed* light brown. **Fig. 2.**

Additional selected specimens examined: Queensland. WIDE BAY DISTRICT: Tinana Creek, 7 km ENE of Tiaro, Jan 2005, Forster PIF30579 et al. (BRI); NW slopes of Mt Glastonbury, Dec 1991, Forster PIF9273 & Sharpe (BRI, CNS, MEL); S of Anderson Road, 10 km W of Cooroy, Nov 1993, Bean 7065 (BRI, NSW, AD, DNA n.v.); Imbil, Dec 1943, Clemens s.n. (BRI [AQ321401]; near Imbil, Jun 1947, Smith & Webb 31162 (BRI).

MORETON DISTRICT: Scientific Area 2, S.F. 309, Enoggera, Jan 1992, *Forster PIF9353 & Machin** (BRI, CNS, MEL, NSW; A, B, K, L, NY, MO n.v.); Laceys Creek, Mt Glorious Road, Taylor Range, Feb 1972, *Webb & Tracey 11246* (BRI, CANB); The Rafting Ground, Kenmore, Dec 1981, *Dickison 294 & Jessup* (BRI); Pimpama River, 3.7 km along Ormeau Road from Pacific Highway, c. 11 km SE of Beenleigh, Jul 1986, *Beesley 8497 & Ollerenshaw* (CANB); c. 2 miles [3.2 km] SW of Canungra, Jan 1971, *Williams s.n.** (BRI [AQ310510], CANB, MEL); Mt Roberts, McPherson Range, Oct 1967, *Blake 22848** (BRI); Roberts Plateau, McPherson Range, Mar 1920, *White s.n.** (BRI [AQ321398]); O'Reilly's, Lamington N.P., Nov 1999, *Rozefelds s.n.** (HO); Morans Falls, Lamington N.P., Aug 1978, *Floyd s.n.** (CANB289092). **New South Wales.** Pacific Highway – Byron Bay Road, May 1964, *Williams s.n.* (NSW); Casino, Dec 1908, *Pope s.n.* (NSW).

Distribution and habitat: *Pseudoweinmannia lachnocarpa* extends from near Tinana in south eastern Queensland to Casino in New South Wales (**Map 1**). It occurs in riverine, coastal or montane rainforest from near sea level to 1000 m.

Phenology: *Pseudoweinmannia lachnocarpa* flowers from October through to January; with fruiting specimens collected between November through to March.

Typification: Mueller's (1874) description of *Weinmannia lachnocarpa* cited collections by both *C. Moore* and *W. Gulfoyle* from the Tweed District of northern New South Wales. The *Gulfoyle* specimen was initially selected by Hoogland in 1984 as the lectotype, and is an appropriate choice as it is the only fruiting specimen. A specimen in K, which is also fruiting, was sent by Mueller and it matches the colouration and appearance of the lectotype and is interpreted as a putative isolectotype.

Notes: The type of *Pseudoweinmannia lachnocarpa* var. *parvifolia* F.M.Bailey differs from the more typical form of the plant in having smaller leaves and fewer stamens. More comprehensive collections, particularly of flowering material, from throughout the range of the species are needed to fully assess this variation although there seems little justification, at present, to recognise a separate variety.

Etymology: The species name, *lachnocarpa*, comes from the Greek *lachnos*, wool and

karpos, fruit, alludes to the dense indumentum covering the fruits.

Common names applied to this species include 'Marara', 'Rose Marara', 'Mararie', 'Merrany', 'Scrub Rosewood', 'Red Carabeen' (Bailey 1900, 1913; Maiden 1922; Francis 1951; Floyd 1989).

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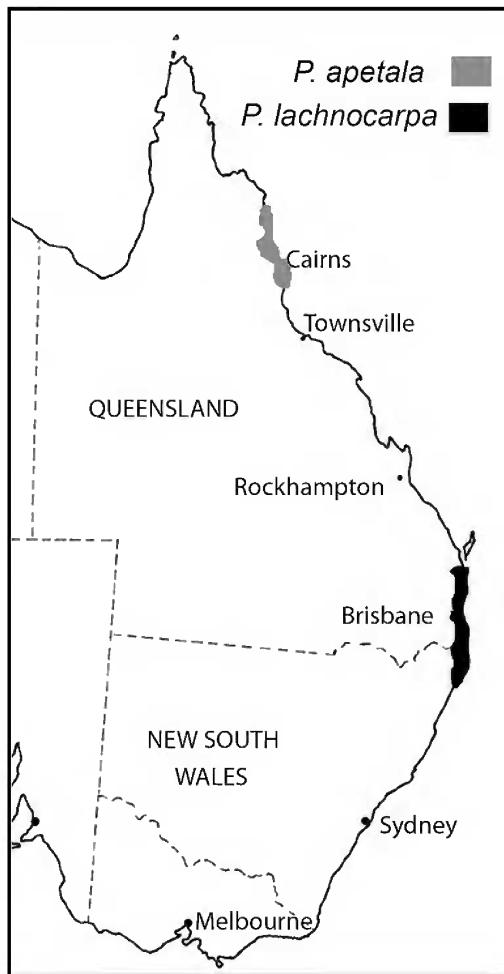
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Map 1. Distribution of *Pseudoweinmannia lachnocarpa* and *P. apetala* in eastern Australia.